

Semi-annual Program Performance Report for NA16NOS0120027
FY 2016-20 Implementation and Development of a Regional Coastal Ocean Observing
System: Alaska Ocean Observing System
For reporting period December 1, 2021 – May 31, 2022
Prepared by Sheyna Wisdom, Project PI on June 30, 2022

1.0. PROGRESS AND ACCOMPLISHMENTS

1.1. Regional Governance & Management Subsystem

1.1.1. Support ongoing board and committee activities.

- The Alaska Ocean Observing System (AOOS) Executive Committee met December 16, 2021 to provide updates on the different awards; on February 24, 2022 to discuss conceptual spend plans for the Year 2 cooperative agreement and infrastructure funds and plan for the spring Board meeting; and plan to meet on June 30, 2022 to give an update on the year 2 non-core descope and the infrastructure funds.
- The Board met on April 29, 2022. Board action items included the approval of John Crowther of the Alaska Department of Natural Resources (ADNR) as a new board member; approved the spend plan for Year 2 core funding; approved the spend plan for the year 2 Harmful Algal Bloom (HABs), Regional Ocean Data Sharing Initiative (RODSI), and Alaska Ocean Acidification Network (AOAN); approved the spend plan for the Infrastructure and Investment Jobs Act (IIJA); approved the increase in micropurchase payment limit; and identified a nominating committee for the Fall Board meeting election of new officers. The IOOS Program Office Deputy Director, Krisa Azyrus, attended the meeting in person. Several program updates were given by staff and subaward Principal Investigators (PIs).

1.1.2. Provide ongoing fiscal and administrative oversight for the program.

- Executive Director Wisdom conducted annual evaluations for Holly Kent, Jill Prewitt, and Darcy Dugan.
- A final descope of the Year 1 funding award was approved December 8, 2021. All subawards and contracts for Year 2 were executed by this date.
- A final descope of the Year 2 core funding award was submitted to the IOOS Program Office in April and approved in June. Subawards and contracts for Year 2 core executed as of June 30, 2022.
- A draft descope of the Year 2 non-core funding award was submitted to the IOOS Program Office at the end of June 2022. We will work with the IOOS program Office to finalize the award. AOOS continues to seek additional external funding, and in this reporting period, four proposals were submitted with AOOS as a partner; all are pending.
- The administrative team has developed and implemented new processes for improved project management and tracking.
- Wisdom and McCammon participated in numerous meetings with the IOOS Program Office and IOOS Association (IA) for funding as part of the Infrastructure Bill.

1.1.3. Support national and international partnerships and collaborations.

- McCammon sits on the IOOS Federal Advisory Committee (FAC), which met virtually in December 2021 and May 2022, as well as, held several administrative calls. The FAC is developing a new set of recommendations to the IOOS Program Office and the Interagency Ocean Observing Committee relating to climate change, the new blue economy, and diversity and inclusion.
- Wisdom and McCammon attended the annual spring IOOS meeting, held virtually, in May. Wisdom was elected on to the IA Finance Committee and meets regularly with the IA Board. McCammon continues to serve on the IA Public Policy Committee. They also participated in IA's strategic planning sessions, as well as IA's Public Policy calls.
- Wisdom represents AOOS in the Consortium for Ocean Leadership and participates in their member calls.
- McCammon finished up her stint as co-lead of the Interagency Arctic Research Policy Committee (IARPC) Environmental Intelligence Collaboration Team, facilitating coordination of Arctic research cruises.

- McCammon sits on NOAA Science Advisory Board's Ecosystem Sciences Management Working Group (WG) which meets virtually every two months. The WG completed a new report on NOAA's Leadership role in Coastal Resilience, and is now focused on addressing needs for rapidly changing living marine resources. McCammon co-hosted a planning session on the UN Decade for Ocean Sciences Arctic Action Plan held virtually and in person at the Arctic Observing Summit in Tromsø, Norway in March 2022. She is now completing a report on that workshop.

1.1.4. Support Alaska and regional partnerships and collaborations.

- AOOS staff continue to attend and co-host the Alaska Marine Policy Forum (AMPF) held every other month.
- Wisdom presented at the Alaska Eskimo Whaling Commission (AEWC) in December 2021 and February 2022 and will continue to attend their tri-annual conventions as possible to continue her long-standing relationship with this organization.
- Wisdom and McCammon continued to engage with the Alaska delegation staff to discuss AOOS and future funding opportunities.
- Wisdom sits on the Alaska Center for Climate Assessment and Policy's (ACCAP) Advisory Committee and is participating in their bi-monthly meetings.
- Wisdom participated in monthly meetings of NOAA's Alaska Regional Collaboration Team.
- Wisdom was on a panel for Arctic research as part of the Arctic Encounter Symposium in April 2022. AOOS also had a booth for the first time in person!
- Wisdom was on a panel for Arctic research as part of the Alaska Command Arctic Symposium in May 2022.
- Wisdom met with members of the Pacific Northwest National Laboratory (PNNL), Bureau of Ocean Energy Management, and NOAA monthly to discuss opportunities for collaboration among these organizations.
- See section 1.2.3 for activities relating to the AOAN, the AHAB Network, and the Alaska Water Level Watch (AWLW). See section 1.2.6 for Alaska Marine Science Symposium (AMSS) activities.

1.2. Outreach, Stakeholder Engagement & Education Subsystem

1.2.1. Support website, Facebook, and printed publications as key AOOS communication tools.

- Kent continued to add content to the new AOOS website and Facebook page, including news, featured stories, and descriptions of new data tools.
- Kent delivered an electronic newsletter to stakeholders in May.

1.2.2. Support stakeholder working groups including ocean acidification network, integrated water level observation network, harmful algal bloom network.

Alaska Ocean Acidification Network

- Darcy Dugan worked with the AOAN steering committee and facilitator Molly Mayo to plan the structure, content, and delivery of a 2022 OA Spring Discussion Series. Each of the four 2-hr sessions drew 40-55 participants and included plenary speakers and a 45 minute breakout session. Topics focused on regional conditions, species response (subsistence, mariculture and commercial) and adaptation and mitigation. A post-event survey showed interest in a future series.
- Dugan facilitated five meetings of the AOAN steering committee, many of which involved developing the ideas, framework, content, or debrief for the discussion series.
- Dugan worked with researchers and stakeholders to launch a new AOAN website. The site includes new pages on each Alaska species that has been studied and what we know about conditions in each region of the state, as well as new content on ways to get involved. The site became live in May 2022.
- Dugan continued writing and producing the AOAN Network eNews, including articles about monitoring, research, outreach, and scientist interviews, as well as maintaining the network website as a hub for OA information in Alaska.
- Dugan hosted an Alaska OA Researcher Update Session during the AMSS in January where 15 researchers provided briefings on their activities and plans. Dugan also made all OA posters and presentations from the virtual symposium available to non-attendees through the AOAN website.
- Dugan worked with OA researchers and fishing industry members to produce two new outreach products: a trifold on OA and Red King Crab in the Bering Sea, and a two-pager on OA and Alaska Salmon. These have been circulated online, through partner list serves, and in person at the ComFish Expo in Kodiak in March. A third product on OA for Southeast Alaska Shellfish growers is underway.
- The AOAN started Twitter and Instagram accounts with support from UAF intern Edie Mari, and conducted a social media push in February with "28 days of OA".
- Dugan traveled to the state legislature in Juneau in April to meet individually with eight coastal legislators,

provide an update on OA in Alaska and answer questions. She organized a panel presentation to the House Fisheries Committee which took place in May, and to the Pacific Seafood Processors Association in April. She also gave presentations to a UAA Oceans & Human Health class and the Kodiak Area Native Association Water Quality Workshop in February and continues to participate in the national CAN calls to coordinate with other OA networks.

- Dugan hosted a meeting of the OA Tribal monitoring working group in April.
Alaska Harmful Algal Bloom Network
- Thomas Farrugia has continued to host monthly meetings with the entire AHAB Network and produce meeting notes from each meeting that are distributed throughout the network. The monthly meetings have received very positive feedback from the network members, and there is a high level of engagement with at least 30 of the 150 Network members participating in every meeting.
- Farrugia has also been maintaining and updating the AHAB website with recent news articles, events, job openings, and funding opportunities related to HABs in Alaska. The website is currently being rebuilt as a stand-alone website and will be unveiled in July 2022.
- AHAB Network members have also contributed to the Alaska Marine Ecosystem Status Reports produced by NOAA's Alaska Fisheries Science Center by reporting on their monitoring and research efforts on HABs during the 2021 season.
- Farrugia has also actively sought out new network members, establishing connections and starting collaborative projects to provide members with support. There are now over 150 individuals from over 50 organizations that are part of the network.
- The AHAB Action Plan (finalized in 2021) has been distributed both electronically and in paper form at conferences and meetings. It has received very positive feedback and will be an important yardstick to assess the progress of HAB work in Alaska in the future.
- Farrugia has also been putting together budgets and spend plans to maximize the benefits of HAB funding for Alaska and the network members.
- Several working groups of the AHAB Network have been formed (including the event coordination, lab capacity, and freshwater HAB working groups), with others coming online soon (the HAB data working group, the outreach and engagement working group).
- There is increased demand from the public in Alaska to better understand freshwater HABs, and this is being addressed by a new working group, as well as state agencies and community groups starting to develop sampling and testing capacity. The infrastructure funding should help increase the capacity of the Department of Environmental Conservation to test for freshwater HABs.
- Farrugia has been engaging in several HABs outreach efforts, including presenting at a variety of meetings and conferences, leading trainings on HAB monitoring, and participating in discussion groups.
- In collaboration with the Alaska Conservation Foundation (ACF), Farrugia has started a pilot program on Community Sampling for HABs. This program is working with 4 communities in Kodiak, Unalaska and St. Paul Island to set up a HAB monitoring program with funds going directly to community samplers. This project will produce HAB species presence/absence data from locations without a long history of HAB monitoring and is testing out an individual payment system for supporting the work of community samplers. This program will continue into next year with additional funds being used for toxin testing of shellfish.
- Farrugia has also been communicating with many network members about the equipment needs in Alaska to further develop the testing capacity in the state. This effort will culminate in an equipment budget to be used for funding requests in the future. Items such as microscopes, freezers, sampling bottles, phytoplankton nets, and lab equipment for toxin testing are all being considered.
- Farrugia is continuing to work with Axiom to revamp the Alaska HAB data portal with the goal of using it as a central, long-term storage of phytoplankton and toxicity data from Alaska. The data sources will be expanded to include all data being collected on HABs in Alaska, as well as all the regular sampling locations, which will be useful when determining geographic gaps in sampling. AOOS has contracted with Ocean and Earth Environmental Services to use their data entry form for HAB samplers in Alaska. These data will be added to the Phytoplankton Monitoring Network database, and will also be visualized on the AOOS HAB portal.
- Farrugia is working on planning and hosting an Alaska HAB stakeholder workshop in early 2023. This workshop will help disseminate information about the status of HAB monitoring, research and forecasting in Alaska, and provide a forum for stakeholder input as to the needs of communities in Alaska.

1.2.3. *Support partnerships with marine education and outreach programs.*

- Staff provided support to Alaska Sea Grant’s marine education programs. A work plan for this support has been developed.

1.2.4. *Support Alaska Marine Policy Forum.*

- AOOS partnered with Alaska Sea Grant to host sessions of the AMPF in April and June.

1.2.5. *Continue to co-sponsor the Alaska Marine Science Symposium.*

- AOOS staff serve on the organizing committee. The 2023 symposium will be held in January 2023.

1.2.6. *Participate in IOOS Outreach Committee.*

- Kent attended monthly meetings of the committee and responded to various requests for materials from the IOOS Program Office for inclusion into IOOS publications and websites.

1.3. Observing Subsystem

1.3.1. *Marine Operations*

1.3.1.1. Sustain weather observations in the Gulf of Alaska (GOA).

- **Subaward to Prince William Sound Science Center (PWSSC) to service 8 SnoTel stations in Prince William Sound (PWS) and Cook Inlet.**

All work associated with this subaward has been completed.

1.3.1.2. Increase access to weather observations using Automatic Identification System (AIS).

- **Subaward to the MXAK to increase access to Weather Observations using AIS.**

All work associated with this subaward has been completed.

1.3.1.3. Sustain critical wave buoys for navigation safety.

- **Operate and maintain Cook Inlet buoy.** Original completion date: December 2021.

All work associated with this line item has been completed.

1.3.1.4. Map surface currents with high frequency radars (HFRs).

- **Subaward to University of Alaska Fairbanks (UAF) to support operation and maintenance of three HFR sites on the Chukchi and Beaufort Seas.**

All work associated with this subaward has been completed.

1.3.1.5. Install three new HFR field sites in the Bering Strait.

- **Subaward to UAF to install three new HFR field sites in the Bering Strait Region.**

- Identify/hire field help in Wales Alaska. Original Completion Date: July 2020. Michael Ahkinga was identified as a local technician in Wales who is assisting with the Wales installation logistics.
Status: Complete.
- Identify reliable power source in Shishmaref, Alaska, to have that site operational for the winter season. Original completion date: September 2020. Reports from Shishmaref indicate a dedicated power source with GFCI outlet has been installed.
Status: Complete.
- Operate and maintain HFR sites in Wales and Shishmaref, Alaska; Original completion date: September 2020 – May 2021, then June 2021. The sites were not operational in 2021. COVID-19 restrictions hindered travel prior to 2022, but those have now been relaxed. In consultation with the landowners, Wales Native Corporation, waiting for ice and snow melt in the region, which has been prolonged through the spring of 2022. A planned site visit is scheduled in July 2022 and the install of the remotely powered HFR site is planned for August/September 2022. Shishmaref site operation is dependent on the timeline with the remote power installation.
Status: Delayed but On-track.
- Ensure the continuation of valid land use agreements, permits, and indemnity for landowners where field sites are located. Original Completion Date: June 2021. The Wales Native Corporation granted permission to use their lands with a fee of \$500/month. The University of Alaska Lands department is finalizing the land lease with the Wales Native Corporation, as well as renewing the land use permit with Shishmaref Native Corporation. IOOS NEPA documentation was updated subsequent to the granted permission of the Wales Native Corporation in September 2021 to relocate the Wales HFR system.
Status: Delayed but On-track..

- Fabricate Remote Power Module (RPM) Lite; Original Completion Date: May 2020. After delays related to COVID-19, APRS World, LLC, completed fabrication of the RPM Lite, which was delivered to Fairbanks in September, 2021.
Status: Complete.
 - Conduct field test of the RPM Lite low power remote power system; Original Completion Date: April – May 2021. The RPM Lite was installed on the coast of Seward, Alaska, at the Seward Marine Center in October 2021 and continues to function well after eight months of operation.
Status: On-track.
- 1.3.1.6. Upgrade two out-of-date HFR systems that are no longer operable, so that they can be utilized for future projects, thereby increasing coverage along the Alaskan coastline.
- **Subaward to UAF to upgrade two out-of-date HFR systems.**
All work associated with this subaward has been completed.
- 1.3.2. *Coastal Hazards & Inundation*
- 1.3.2.1. Increase water level observations in western & northern Alaska.
- **Subaward to the Alaska Department of Natural Resources (ADNR) to Facilitate an Integrated, Interagency Water Level Network for the Alaska Coast.**
All work associated with this subaward has been completed.
 - **Contracts to JOA and ASTRA to install water level instrumentation at Utqiagvik, Alaska.**
All work associated with this subaward has been completed."
 - **Contract to ASTRA to operationalize codes that process global navigation satellite system (GNSS) observations to extract water level measurements.**
All work associated with this subaward has been completed."
 - **Contract to JOA to install a long term water level station in Dillingham, AK.**
All work associated with this subaward has been completed."
- 1.3.2.2. Increase wave observations for forecasting and planning.
- **Deploy & support CDIP buoy in Nome;** Original completion date: May 2021.
All work associated with this subaward has been completed.
 - **Support operations and maintenance for the National Renewable Energy Laboratory (NREL) owned Kodiak CDIP buoy.**
All work associated with this line item has been completed.
- 1.3.2.3. Initiate statewide geospatial mapping coordination
All work associated with this line item has been completed.
- 1.3.2.4. Improve the robustness of NOAA tsunami warnings for earthquakes in Alaska.
- **Subaward with the Alaska Earthquake Center at the Geophysical Institute of the UAF.**
All work associated with this subaward has been completed.
- 1.3.2.5. Develop the Alaska Water Level Watch Data Portal
- **Subaward to Axiom to develop a prototype data management system and associated interface to house the various water level data at AOOS.**
All work associated with this subaward has been completed.
- 1.3.3. *Ecosystems, Fisheries & Climate Trends*
- 1.3.3.1. Sustain ship-based sampling along the Seward Line.
- **Subaward to UAF to support sampling along the Seward Line.**
All work associated with this subaward has been completed.
- 1.3.3.2. Support ecosystem moorings in Alaska's Large Marine Ecosystems.
- **Subaward to UAF to continue the incremental build-out of a moored Gulf of Alaska Ecosystem Observatory (GEO) and the Bering Sea Ecosystem Observatory by providing funding for equipment purchases and continuing support for Chukchi Ecosystem Observatory (CEO).**
All work associated with this subaward has been completed.
 - **Subaward to UAF to add additional sensors to the CEO and GEO moorings with Fill the Gaps funds in support of Arctic Marine Biodiversity Observing Network (AMBON)**
All work associated with this subaward has been completed.

- **Funding set aside to NOAA/Alaska Fisheries Science Center to Expand Mooring Site M8 with New Sensors.**
 - Deploy new equipment at mooring location, sampling at hourly intervals; Original completion date: September 2020.
Status: Complete.
 - Turnaround equipment at mooring location; Original completion date: May 2021.
Status: Canceled due to COVID-19.
 - Turnaround equipment at mooring location; Original completion date: September 2021.
Status: Canceled due to COVID-19.
- **Subaward to University of Texas at Austin (UTA) with Fill the Gaps (FTG) funds to purchase sensors to add to three moorings in the Beaufort Sea coastal area;** Original completion date May 2021.
All work associated with this subaward has been completed.
- 1.3.3.3. Pilot use of gliders to monitor ocean conditions and marine mammals
 - **Subawards to Woods Hole Oceanographic Institute (WHOI), UAF, and University of Washington (UW) to conduct a simultaneous marine mammal and oceanographic survey of the Chukchi Sea using a Slocum autonomous underwater glider.**
All work associated with this subaward has been completed.
- 1.3.3.4. Pilot the use of gliders to assist in an ecosystem approach to fisheries management
 - **Subaward to UAF to purchase equipment and begin glider surveys in the Gulf of Alaska and the Bering Sea.**
All work associated with this subaward has been completed.
- 1.3.3.5 Demonstrate operational readiness of AUV-based ecosystem monitoring through a field program supporting the International Year of the Salmon (IYS).
 - **Subaward to UAF and UW to expand the sampling capability of a Slocum autonomous underwater glider to provide in-situ ecosystem monitoring.**
All work associated with this subaward has been completed.
 - **Subaward to Axiom to expand the sampling capability of a Slocum autonomous underwater glider to provide in-situ ecosystem monitoring.**
All work associated with this subaward has been completed.
- 1.3.3.6 Improve the forecasting of ocean acidification that will benefit fishery biologists in NOAA's Integrated Ecosystem Assessment (IEA) Program and fisheries managers through the Ecosystem Status Reports (ESR).
 - **Subaward to UAF to co-locate chemical monitoring and forecasts with current fishery and ecosystem monitoring.** Original completion date: May 2021.
 - The plan to collect and analyze samples as part of the Bering Arctic Subarctic Integrated Survey (BASIS) survey cruise was canceled again in 2021 (also canceled in 2020) due to COVID-19. Under a normal timeline, samples would be analyzed during the year following the field work (Fall 2022 – Summer 2023) and data would be finalized and archived before two years had passed (Summer 2024). A No Cost Extension (NCE) was approved by AOOS/IOOS/NOAA for this project until May 2024. The 2022 BASIS cruise is being led by NOAA AFSC PI Alex Andrews and will take place aboard the NOAA Ship Oscar Dyson from August 10 to September 10, 2022. Meetings with Andrews will begin in June 2022 to define shipping and sampling details. The rapid return of the collected samples will be essential to begin analysis to allow for preliminary results for the ESR draft deadline in October 2022.
 - *Status: Delayed.*
- 1.3.3.7. Regional Sentinel Observations
 - **Subaward to PWSSC to support partnership to operate and maintain acoustic arrays across major PWS entrances and maintain conductivity sensor.**
All work associated with this subaward has been completed.
 - **Funding set aside to NOAA/UAF's Kasitsna Bay Laboratory and other partners to collect oceanographic data along repeated transects in Kachemak Bay and lower Cook Inlet.**
All work associated with this subaward has been completed.
- 1.3.3.8. Develop data products in the Alaska region to support NOAA's Regional Collaboration Team.
 - Regional Ocean Data Sharing Coordinator (Prewitt) coordinated and worked with Axiom to continue reviewing data sources for the project and gather feedback on the prototype for the dashboard. Progress has been delayed. New projected completion date Fall 2022.

Status: Delayed.

- **Subaward to Axiom to enhance the utility of the Alaska Fisheries Science Center’s Ecosystem Status reports and IEA Indicators.**

All work associated with this subaward has been completed.

1.3.3.9. Prepare historical records of seabird mortality data to conform with Darwin Core Standards for ingestion to AOOS data portals using Matt Howard funding.

- **Contract to Coastal Observation and Seabird Survey Team (COASST), UW to integrate COASST Beached Bird Monitoring Data into AOOS Using Darwin Core Standards.**

All work associated with this subaward has been completed.

- **Contract to Axiom to align biological datasets to the Darwin Core Standard and make them available through ERDDAP servers and the AOOS and Marine Biodiversity Observing Network (MBON) data portals.**

All work associated with this subaward has been completed.

1.3.4. *Water Quality*

1.3.4.1. Sustain OA monitoring including moorings, sampling along the Seward Line, Burke-o-lators (BoL), and an instrumented ferry.

- **Subaward to UAF to continue a ten-year time-series in the GOA along the Seward Line as well as support the deployment of OA moorings adjacent to the oceanographic sampling line.** Original Completion Date: September 2020.

All work associated with this subaward has been completed.

- **Subaward to Alutiiq Pride Shellfish Hatchery to maintain continuous ocean acidification monitoring using a permanently installed BoL, including community sampling;** Original Completion Date: November 2020.

All work associated with this subaward has been completed.

- **Subaward to UAF to conduct a regional OA Monitoring Cruise in the GOA.**

This cruise was originally planned to sample the entire Gulf of Alaska in summer 2019 but was postponed due to the 2019 Federal shutdown delaying funds to secure a research vessel. Due to the lack of vessels available for a Gulf-wide cruise in 2020, plans were pared down to only include observations in southeast Alaska. The revised cruise plans were canceled due to COVID-19. In 2021, the cruise was canceled again due to a lack of infrastructure, ship availability, and COVID travel restrictions. The current plan is to conduct an ocean acidification survey in the southeastern Gulf of Alaska in September 2022 aboard the University of Washington’s R/V Rachel Carson. Under a normal timeline, samples would be analyzed during the year following the field work (Fall 2022 – Summer 2023) and the data would be finalized and archived before two years had passed (Summer 2024). Currently, an NCE has been approved by AOOS/IOOS/NOAA for this project through May 2024.

Status: Delayed

- **Subaward to Rutgers University to assess pH and plankton in the GOA.** Original Completion Date: May 2021.

AOOS and UAF staff met with the IOOS Program Office in July 2021 to discuss the need for an NCE; the general consensus was the AOOS and UAF would ask for an NCE through May 2024 to allow for data collection and analysis.

- Prep glider for deployment. This includes calibration of sensors, glider ballasting, and packing for shipment; Original completion Date: March 2021. The primary lithium batteries and the glider science bay with the calibrated pH/CTD sensor has been installed. Glider preparation is completed and the glider (and associated equipment) is packed for shipping to the deployment location (Sitka).

Status: Complete

- Ship glider to deployment location in Southeast Gulf of Alaska, final preparations for deployment (specifically re-condition the pH/CTD sensor after shipment); Original completion Date: Apr 2021. This milestone is on-track for shipping during June; final preparations for deployment will occur in mid-July). Final preparations for the glider will be conducted at the Sitka Sound Science Center (SSSC).

Status: On track under new schedule.

- Deploy vertically-profiling glider in Southeast Gulf of Alaska (either 1 long transect or two shorter transects, still TBD); Original Completion Date: September 2021.

Will occur July - Sept 2022. Discussions with the larger project team led to planning 1 (up to 90-day)

deployment powered with a standard lithium battery pack. The deployment will occur out of Sitka and will be received by the R/V Rachel Carson in September.

Status: On track under new schedule.

- Perform data quality control; Service sensors if needed; Original completion date: Dec 2021. This will occur post-deployment – through May 2023.

Status: On track under new schedule.

- Glider data processing, analysis, and management; begin figure preparation, presentations, manuscript writing; Original completion date: May 2022. This will occur post-deployment – through May 2023.

- **Subaward to Hakai Institute to operate and maintain the ocean acidification instrumentation onboard the Alaska Marine Highway ferry *Columbia*.**

All work associated with this subaward has been completed.

- **Subaward to the Sitka Tribe of Alaska/ Southeast Alaska Tribal Ocean Research Network (SEATOR) to support the Indigenous led baseline ocean acidification data collection and monitoring efforts.**

All work associated with this subaward has been completed.

- **Subaward to the Alutiiq Pride Shellfish Hatchery to support ocean acidification infrastructure maintenance and improvement;** Original completion date: May 2021.

All work associated with this subaward has been completed.

1.3.4.2. Support Alaska OA Network

- AOOS received funding from the national OA Program to support the AOAN. Original Completion Date: May 2021. Now on track to be completed by May 2022.

All work associated with this subaward has been completed.

1.3.4.3. Support Alaska Harmful Algal Bloom Network

- **Subaward to Alaska Sea Grant to provide outreach support to Bering Strait Communities;**

All work associated with this subaward has been completed.

- **Subaward to Axiom to provide data management support to the coordination of state-wide HAB data collection and sharing efforts across state, federal, local, tribal agencies, researchers, and communities.**

All work associated with this subaward has been completed.

1.3.4.4. Support the University of Alaska's Ocean Acidification Research Center (OARC).

- **Subaward to the UAF to execute a comprehensive carbonate chemistry assessment of US Distributed Biological Observatory (DBO) activities.**

All work associated with this subaward has been completed.

- **Subaward to the UAF to support the ocean acidification monitoring network in Alaska Coastal Seas.**

All work associated with this subaward has been completed.

1.3.5. Streamline access to Observations

All work associated with this line item has been completed.

1.4. Data Management & Communications Subsystem, subaward to Axiom

1.4.1. Provide Core Data Management & Cyberinfrastructure (DMAC) Support

1.4.1.1. Provide technical support for AOOS cyber infrastructure.

All work associated with this subaward has been completed.

1.4.1.2. Data Portal Development.

All work associated with this subaward has been completed.

1.4.1.3. Maintain QARTOD testing for applicable data streams to remain RICE compliant and enhance the quality control system with advanced and user-requested applications.

All work associated with this subaward has been completed.

1.4.2. Provide DMAC support to the AOOS program

1.4.2.1. Provide overall DMAC project management and oversight.

All work associated with this subaward has been completed.

1.4.2.2. Participate in regional, state, national and international DMAC activities.

All work associated with this subaward has been completed.

1.4.2.3. Implement recommended and standard data management procedures for AOOS data assets.

All work associated with this subaward has been completed.

1.4.3. Develop and maintain special data products

1.4.3.1. Support existing data products.

All work associated with this subaward has been completed.

1.4.3.2. Ingest new datasets and metadata.

All work associated with this subaward has been completed.

1.4.3.3. Develop new data products.

All work associated with this subaward has been completed.

1.4.4. Host and Support AOOS Website

1.4.4.1. Host and maintain the AOOS web portal.

All work associated with this subaward has been completed.

1.4.4.2. Provide access to data portal through website.

All work associated with this subaward has been completed.

1.4.5. Support national IOOS Program data management activities

1.4.5.1. Maintain and Enhance Data Access Service Software: ERDDAP and Environmental Sensor Map (ESM) and Global Data Integration

- **Task 1: Maintain and Enhance Data Access Service Software – ERDDAP**

All work associated with this subaward has been completed.

- **Task 2: ESM and Global Data Integration Environmental Sensor Map.**

All work associated with this subaward has been completed.

1.4.5.2. MBON Data Portal

- **Task 1: Technical development to improve performance of POC portal.**

All work associated with this subaward has been completed.

- **Task 2: Scoping and build-out of MBON and ATN portal integration.**

All work associated with this subaward has been completed.

- **Task 3: Load and visualize more data.**

All work associated with this subaward has been completed.

- **Task 5: Improve documentation.**

All work associated with this subaward has been completed.

- **Task 6. Engage with newly funded MBON projects.**

All work associated with this subaward has been completed.

- **Task 7. Meeting Participation and Travel.**

All work associated with this subaward has been completed.

1.4.5.3. Finalize HFR Range Series File Archiving through the Research Workspace

- **Task 1: Provide space in the Research Workspace to store all range series files for all HFR operators within the IOOS HFRNet (100%)**

All work associated with this subaward has been completed.

- **Task 2: With input from the IOOS Program Office, scientists, and HFR operators, evaluate and develop new data tool(s) for improved decision-making.**

All work associated with this subaward has been completed.

- **Task 3: Improve documentation on IOOS HFR website.**

All work associated with this subaward has been completed.

- **Task 4: Project communications.**

All work associated with this subaward has been completed.

1.4.5.4. Saildrone 2: Novel Streamlined Data from Platform to Application through Cloud hosted Data Acceptance and Quality Control

All work associated with this subaward has been completed.

1.5.1. Support Existing Models & Data Products Including Historical Sea Ice Atlas, Research Assets Map and Yukon-Kuskokwim Chinook Run Timing Forecast.

- **Subaward to University of Alaska International Arctic Research Center to update Historical Sea Ice Atlas twice a year.**

All work associated with this subaward has been completed.

- **Support and maintain Research Assets Map;**

All work associated with this subaward has been completed.

- **Coordinate with the ADF&G to update Yukon-Kuskokwim Chinook Run Timing Forecast pages on AOOS.org website;**

All work associated with this subaward has been completed.

- **Subaward to Axiom to provide Statistically-generated Probabilistic Sea Ice Guidance for the week 3 to**

Seasonal Time Scale (S2S Sea Ice Guidance);

All work associated with this subaward has been completed.

- **Subaward to Axiom to provide a High Fidelity Prediction System for Coastal Storm Hazards in Support of Disaster Prevention and Safe Navigation;**

All work associated with this subaward has been completed.

1.5.2. *Support for the NOAA State of the Arctic Report*

- **Subaward to UAF to support NOAA Climate Program Office development of annual report card.**

All work associated with this subaward has been completed.

1.5.3. *Support enhancement of OceanMesh2D capabilities to develop more accurate and efficient meshes of the global and coastal ocean.*

- **Subaward to University of Notre Dame.**

All work associated with this subaward has been completed.

1.5.4. *Support development of a Regional Ocean Data Partnership.*

- Regional Ocean Data Sharing Coordinator continued working with stakeholders to determine data product priorities and assess availability of data. Original completion date May 2021.

All work associated with this line item has been completed.

- **Subaward to UAF International Arctic Research Center (IARC) to provide outreach materials and community engagement activities for this new data sharing initiative.**

○ All work associated with this subaward has been completed.

- **Subaward to Axiom to develop data products in the Alaska region to support the national Regional Ocean Data Sharing Initiative.**

All work associated with this subaward has been completed.

1.6. Additional Activities and Successes Related to Mission

None to report

2.0 SCOPE OF WORK

We do not expect any other changes to the project Scope of Work at this time.

3.0 PERSONNEL AND ORGANIZATIONAL STRUCTURE

There have been no changes.

4.0 BUDGET ANALYSIS

All financial reports are up to date and have been submitted on time. There are no risks to the project that need identifying. The following equipment was purchased during this period:

Equipment	Serial Number	Use Description	Full Cost
SeaBird Suna	SUNA 1471	used to measure nutrients	42,508.50